9110-04-P

DEPARTMENT OF HOMELAND SECURITY

Coast Guard

USCG-2013-0316

Outer Continental Shelf Units - Fire and Explosion Analyses

AGENCY: Coast Guard, DHS.

ACTION: Notice of recommended interim voluntary guidelines.

SUMMARY: As part of its continuing response to the explosion, fire and sinking of the mobile offshore drilling unit (MODU) DEEPWATER HORIZON in the Gulf of Mexico on April 20, 2010, the Coast Guard is providing recommended interim voluntary guidelines concerning fire and explosion analyses for MODUs and manned fixed and floating offshore facilities engaged in activities on the U.S. Outer Continental Shelf (OCS).

DATES: The recommended voluntary guidelines in this notice are effective [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER].

Documents mentioned as being available in the docket are part of docket USCG-2013-0316 and are available for inspection or copying at the Docket Management Facility (M-30), U.S. Department of Transportation, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE,

Washington, DC 20590, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. You may also find this docket on the Internet by going to http://www.regulations.gov, inserting USCG-2013-0316 in the "Keyword" box, and then clicking "Search."

FOR FURTHER INFORMATION CONTACT: If you have questions on this notice, call or e-mail LCDR John H. Miller, U.S. Coast Guard, Office of Design and Engineering Standards, Lifesaving and Fire Safety Division (CG-ENG-4), telephone (202) 372-1372, e-mail John.H.Miller@uscg.mil.

Background

The "Report of Investigation into the Circumstances Surrounding the Explosion, Fire, Sinking and Loss of Eleven Crew Members Aboard the Mobile Offshore Drilling Unit (MODU) DEEPWATER HORIZON in the Gulf of Mexico, April 20-22, 2010," (hereinafter referred to as "Report"), and related Commandant's Final Action Memo, dated September 9, 2011, contain a number of recommendations for OCS safety improvements that are presently being evaluated for further regulatory action. (These documents may be found in the docket for this action, as indicated under ADDRESSES).

Recommendations 1D, 1E, 2B, 2C, 2E, and 3A in the Report urged the Coast Guard to evaluate the need for fire and explosion risk analyses to ensure an adequate level of

protection is provided for accommodation spaces, escape paths, embarkation stations, and structures housing vital safety equipment from drill floor and production area events. The Report highlighted the following considerations as areas not specifically addressed by current regulations:

- Minimum values are needed for explosion design loads for use in calculating the required blast resistance of structures;
- Explosion risk analysis of the design and layout of each facility should be performed to identify high risk situations;
- H-60 rated fire boundaries between the drilling area and adjacent accommodation spaces and spaces housing vital safety equipment may be necessary dependent on the arrangement of the facility;
- Uniform guidelines for performing engineering evaluations to ensure adequate protection of bulkheads and decks separating hazardous areas from adjacent structures and escape routes for likely drill floor fire scenarios are necessary;
- Performance-based fire risk analysis should be used to supplement the prescriptive requirements

in the MODU Code; such analysis should use defined heat flux loads to calculate necessary levels of protection for structures, equipment, and vital systems that could be affected by fires on the drill floor;

- Maximum allowable radiant heat exposure limits for personnel at the muster stations and lifesaving appliance launching stations in anticipated evacuation scenarios should be implemented.

To implement these recommendations, a future Coast Guard rulemaking will address fire and explosion risk analyses for MODUs and manned fixed and floating offshore facilities engaged in OCS activities. Comments will be invited in connection with that rulemaking.

Currently, there is no requirement in the current OCS regulations, in Title 33 of the Code of Federal Regulations (CFR), that requires a fire and explosion analysis that would implement the recommendations from the Report. Furthermore, while Section 9 of the 2009 IMO MODU Code contains some recommendations on the parameters of fire and explosion risk analysis, we believe that these recommendations are not sufficiently specific to adequately

and consistently address these recommendations from the Report on their own.

We believe that the recommendations from the 2009 IMO MODU Code are insufficiently specific for several reasons. Section 9.3.1 of the 2009 MODU Code provides, "In general, accommodation spaces, service spaces and control stations should not be located adjacent to hazardous areas. However, where this is not practicable, an engineering evaluation should be performed to ensure that the level of fire protection and blast resistance of the bulkheads and decks separating these spaces from the hazardous areas are adequate for the likely hazard." This requirement is not specific enough to consistently ensure the protection of safety-critical spaces and elements aboard MODUs and manned fixed and floating offshore facilities engaged in OCS activities, and needs to be supported by guidance to better define what the "engineering evaluation" should include and what performance criteria should be met to ensure "adequate protection" is provided. Safety-critical spaces and elements refers to any accommodation or work area, equipment, system, device, or material, the failure, destruction, or release of which could directly or indirectly endanger the survivability of the facility and the personnel onboard. These safety-critical spaces and

elements can include, but not be limited to, control stations, accommodation areas, vital safety equipment, escape routes and survival craft launching areas, and other equipment with escalation potential (e.g., fuel storage). Survivability refers to the event threshold determined by the company for the purposes of fire and explosion. This normally includes the specification of a sufficient period of time to maintain the habitability of safety-critical spaces and escape routes, temporary refuge, and muster areas to allow for emergency response and boarding of survival craft and subsequent evacuation of the facility.

Additionally, Section 9.4.5 of the 2009 MODU Code also requires that, "Consideration should be given by the Administration to the siting of superstructures and deckhouses such that in the event of fire at the drill floor at least one escape route to the embarkation position and survival craft is protected against radiation effects of that fire as far as practicable." This requirement is not specific enough to consistently ensure the protection of escape routes aboard MODUs and manned fixed and floating offshore facilities engaged in OCS activities, and needs to be supported by guidance to better define what level of "radiation effects" to personnel and safety equipment is acceptable.

The Coast Guard believes the fire and explosion analysis guidelines set forth below are needed to uniformly implement the recommendations in paragraphs 9.3.1 and 9.4.5 of 2009 MODU Code, and address recommendations 1D, 1E, 2B, 2C, 2E, and 3A of the Report. It is the Coast Guard's belief that following these recommendations would yield significant safety improvements. These guidelines were developed based on industry standards, technical expert advice, and fire protection engineering references. These guidelines are intended for use in the design phase of new facility construction; however, they may be useful in assessing and increasing the safety of existing facilities.

Interim Voluntary Guidance

(a) Introduction

As an interim measure pending a Coast Guard future rulemaking, owners/operators of MODUs and manned fixed and floating offshore facilities operating on the U.S. OCS are urged to consider voluntary compliance with the guidelines laid out below, to the extent appropriate and practicable.

The intent of the recommendations set forth below is to provide a consistent approach for adequate protection of personnel and safety-critical spaces and elements located on MODUS and manned fixed and floating offshore facilities against potential fire and explosion events following a

catastrophic failure such as loss of well control. This approach should consider all facility operating modes including startup, maintenance periods, crew turnover, etc.

(b) Recommendations

(1) Engineering Evaluation

The engineering evaluation of fire and blast loads in the design of offshore facilities should follow an established and widely accepted approach, normally based on the fire and explosion risk of hydrocarbon fuel sources. An engineering evaluation should identify hazards and the potential damage of major accident events. This evaluation should consist of a methodology that may include the following: hazard identification, consequence evaluation, adequacy of control and mitigation measures, and final risk assessment. The evaluation should be completed by a Registered Professional Fire Protection Engineer with experience in fire and explosion analysis, or by a recognized class society (under 46 CFR part 8) with similar equivalent experience.

This evaluation should include establishment of accepted performance criteria to demonstrate that appropriate mitigating measures have been implemented to ensure survivability of the facility and personnel.

The Coast Guard recommends the use of American Petroleum Institute (API) Recommended Practice (RP) 2FB for conducting an engineering evaluation.

We note that there are other standards available that can be used for the engineering evaluation. We chose API RP 2FB because it contains thorough coverage of the elements which are important to an engineering evaluation and because the Coast Guard actively participates in the API committee process. We do note that there are alternative approaches that have been widely accepted by the oil and gas industry meeting the intent of this recommendation.

(2) Explosion Protection

Maximum allowable values for explosion design loads should be determined based on accepted industry standards and used to calculate the required blast resistance of structures for each particular arrangement. Explosion design load means a nominal, peak overpressure that has been defined in industry standards based on a limited data set for a number of platform concept types (nominal values are determined from acquired experience or physical conditions). In cases where vulnerabilities are noted, facility arrangements should be modified or additional protective measures provided.

We recommend use of the unmodified nominal explosion overpressures by facility type and load modifiers listed in

API RP 2FB, Tables C.6.3.1-1 and C.6.3.2-1, where appropriate. As described in the guide, load modifiers should be used to account for the higher or lower pressures that may be associated with specific facility arrangements or operations.

We do note that there are alternative explosion design loads that have been widely accepted by the oil and gas industry meeting the intent of this recommendation.

(3) Fire Protection

The radiant heat flux produced by particular hazards should be prescribed and calculations completed to assess the effects on safety critical spaces and elements. Radiant heat flux means the rate of heat transfer per unit area perpendicular to the direction of heat flow; normally expressed in kilowatts per meters squared (kW/m^2) or British Thermal Units per second foot squared ($Btu/(s*ft^2)$). Radiant heat flux is a measure of the potential for injury, damage or fire spread (e.g., most common combustibles ignite when exposed to a radiant heat flux of 0.9-1.8 $Btu/(s*ft^2)$ or 10-20 kW/m^2).

The radiant heat flux from typical drill floor fire sources should be approximated from the following:

(i) As specified in API RP 2FB, jet fires may give rise to radiant heat flux levels on the order of 300 KW/m^2 in

open conditions and up to 400 KW/m^2 in confined areas. Jet fire refers to a high-pressure release of any flammable fluid or gases in a solution that forms a jet which is ignited, and in which the flame burns back against the flow towards the release point;

(ii) As specified in API RP 2FB, pool fires may give rise to lower radiant heat flux levels on the order of 100-160 KW/m^2. Pool fire refers to a body of fuel that is confined by physical boundaries (e.g., obstructions on the floor will limit a fuel release to a smaller area than the potential unconfined spill area).

Where the safety-critical spaces and elements are exposed to a radiant heat flux up to 100 KW/m^2, a passive structural fire protection equivalent rating of A-60 should generally be considered sufficient for the surface facing the source of the radiant heat flux. For radiant heat flux levels 100 KW/m^2 and above, H-60 rated protection should be considered as a minimum. In either case, the protection should continue on the adjacent sides of such structures for a minimum distance of 10 feet (3 meters) from the surface facing the source of the radiant heat flux (SOLAS II-2/9.2.4.2.5). This overlapping of protection on adjacent

areas is necessary to prevent the radiant heat from "wrapping around" to expose an inadequately protected area.

The Coast Guard recommends use of the following references for calculating the radiant heat flux at a target from a fire source (i.e., pool or jet fire).

(i) The SFPE Handbook of Fire Protection Engineering, Fourth Edition (Section 3, Chapter 10);

(iii) API Recommended Practice 2FB.

We do note that there are alternative baseline radiant heat flux levels and calculations that have been recognized by the oil and gas industry meeting the intent of this recommendation.

(4) Heat Exposure

The maximum radiant heat exposure to personnel should be evaluated at the assembly/muster stations and survival craft launching stations as well as along the normal escape routes from the accommodation and service areas to those areas.

The maximum allowable radiant heat flux exposure for personnel at the muster stations and survival craft launching stations should be low enough to prevent injury when exposed for the period of time needed to embark and launch the

survival craft (normally around 2.5 KW/m^2 for approximately thirty minutes on bare skin).

The Coast Guard recommends use of the following references for calculating the radiant heat flux exposure to a target and the limits on personnel exposure:

(i) The SFPE Handbook of Fire Protection Engineering, Fourth Edition (Section 2, Chapter 6; Section 3, Chapter 10);

(ii) Fire Protection Handbook, Twentieth Edition (Section 6, Chapter 2);

(iii) API Recommended Practice 2FB.

We do note that there are alternative methods for calculating radiant heat flux exposure to personnel and exposure limits which meet the intent of this recommendation.

(5) Mitigation

Where the explosion design load, radiant heat flux and radiant heat exposure values calculated for the facility exceed the recommended performance standard of the equipment in place, mitigation measures, such as venting, increased structural strength of blast-walls, bulkheads and decks,

passive fire protection, re-arrangement and shifting of structures, or other viable and analyzed mitigation measures should be incorporated.

Authority; Disclaimer

This document is issued under the authority of 5 U.S.C. 552(a), 43 U.S.C. 1331, et seq., and 33 CFR 1.05-1. The guidance contained in this notice is not a substitute for applicable legal requirements or current Coast Guard and Bureau of Safety and Environmental Enforcement regulations, nor is it itself a regulation. It is not intended to nor does it impose legally binding requirements on any party. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other Federal and State regulators, in instituting lessons learned from the Report.

Dated: April 28, 2014.

J.G. Lantz,
Director of Commercial Regulations and Standards,
U.S. Coast Guard.

[FR Doc. 2014-10010 Filed 05/01/2014 at 8:45 am;
Publication Date: 05/02/2014]